BIOASSESSMENTS OF TRIBUTARIES OF THE BOULDER RIVER JEFFERSON COUNTY, MONTANA

September, 1997

prepared for

The Montana Department of Environmental Quality
Helena, Montana

by

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May, 1999

INTRODUCTION

Benthic macroinvertebrates are known to be important indicators of stream ecosystem health (Hynes 1970). Life spans for some of these creatures are as long as three or more years, and their complex life cycles and limited mobility mean that there is ample time and opportunity for the community to respond to cumulative effects of environmental perturbations. The analysis of macroinvertebrate communities can thus be related to a stream's biological health, or integrity, defined by Karr and Dudley (1981) as "...the capability of supporting and maintaining a balanced, integrated, adaptive community of organisms having a species composition, diversity and functional organization comparable to that of natural habitat of the region."

The multimetric approach to bioassessment using benthic macroinvertebrates uses attributes of the assemblage in an integrated way to reflect overall biotic condition. Community attributes that can contribute meaningfully to bioassessment include assemblage structure, sensitivity of community members to stress or pollution, and functional traits. Each metric component contributes an independent measure of the biotic integrity of a stream site; combining components into an overall score reduces variance and increases precision of the assessment. (Fore et al. 1996).

This report presents and interprets data collected in 1997 from tributaries of the Boulder River, using multimetric methodologies that are adaptations of the U.S. EPA's Rapid Bioassessment Protocols (RBP) (Plafkin et al. 1989). The streams have been exposed to varying degrees of impairment due to metal-mining impacts, and the study was undertaken to ascertain responses of the macroinvertebrate communities to these impairments.

METHODS

Aquatic macroinvertebrates were sampled by personnel of the Montana Department of Environmental Quality (MT DEQ) from five tributaries of the Boulder River in September of 1997. Sampling methods are described by Bukantis (1998) in MT DEQ's standard operating procedures for macroinvertebrate sampling. Macroinvertebrate samples were delivered to Rhithron Biological Associates for laboratory and data analyses.

In the laboratory, the RBP III sorting method was used to obtain subsamples of 300 (+/- 10%) organisms from each sample when possible. Some samples contained fewer than 300 organisms; in these cases, entire sample contents were sorted and all organisms removed. Community structure, function, and sensitivity to impact were characterized for each subsample using two methods prescribed by MT DEQ (Bukantis 1998). First, data were evaluated using the Montane Ecoregions reference. In this approach, benthic communities were compared to reference criteria established by MT DEQ for streams of the Montane Ecoregions, defined by Omernik et al.(1997). The Montane Ecoregions reference approach uses seven metrics (Bukantis 1998). In the second approach, an internal reference was identified for the Boulder River tributaries from among the sites sampled. Based on the seven metric values, the Little Boulder River site provided the best internal reference, though Jack Creek above the Bullion mine was another alternative. Metric values for all sites were compared with values from the reference site, and scoring criteria followed the system devised by McGuire (1995).

For each of these analyses, actual metric values were compared to the reference

values to obtain metric scores. Biointegrity was estimated as the total bioassessment score, that is, the combined score for all metrics expressed as a percentage of the maximum possible score. Impairment classifications and "use support" designations were assigned, based on the total bioassessment score, according to criteria demonstrated in Table 3 (a and b). No habitat data or assessment accompanied the macroinvertebrate samples, thus impairment due to water quality degradation, including that due to metals contamination could not be definitively distinguished from that due to habitat degradation.

RESULTS

Macroinvertebrate taxa lists, metric results and other information for each sample are given in the Appendix.

The Montane Ecoregions reference

Figure 1 compares total bioassessment scores from integrated and summed metrics using the ecoregion reference scoring criteria. Bukantis (1998) summarizes this method and criteria. Breakdown of scores for each metric is presented in Table 1(a,b,c and d).

Based on scores compared to the ecoregion reference, Jack Creek appears to be unimpaired, or, at most, slightly impaired above the Bullion mine, but moderately impaired below the mine. Cataract Creek above Uncle Sam Gulch was non-to-slightly impaired, but was slightly impaired below the gulch. High Ore Creek was moderately impaired. Both Basin Creek above Basin and the Little Boulder River scored excellently for nearly all metrics, and were classified as unimpaired using these criteria.

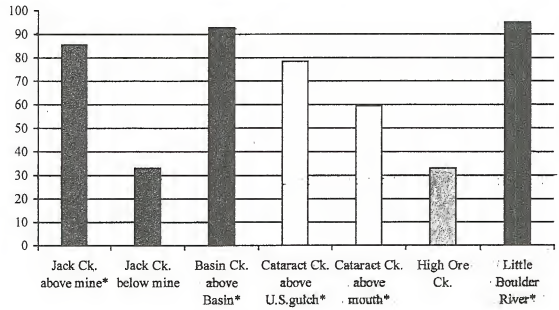

Figure 1. Total bioassessment scores, based on the Montane Ecoregions reference, for tributaries of the Boulder River. Total scores are expressed as percent of maximum score. Scores for sites marked by asterisks are mean scores for replicated samples.

The internal reference

Figure 2 compares total bioassessment scores using an internal reference scoring criteria, with the Little Boulder River serving as the reference site. Table 2 summarizes the method and its scoring criteria. Table 4 (a,b,c and d) gives a breakdown of the scores of individual metrics for each site.

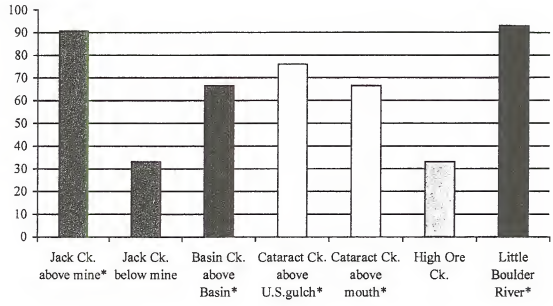

Figure 2. Total bioassessment scores, based on the internal reference, for tributaries of the Boulder River. Total scores are expressed as percent of reference score. Scores for sites marked by asterisks are mean scores for replicated samples.

The bioassessment approach using internal reference criteria compares the tributaries with each other rather than with streams throughout the Montane Ecoregions. In this context, Basin Creek compares much less favorably to the other sites than it did when ecoregion criteria were used; the total bioassessment score has fallen to 67% of that of the reference condition. All other sites scored similarly regardless of the reference criteria used.

Macroinvertebrate communities

Above the Bullion mine, Jack Creek exhibited a benthic community typical of a healthy montane stream. Eleven sensitive insect taxa were collected in the replicated samples; the most abundant taxon present was the stonefly *Zapada columbiana*. This shredder is relatively intolerant of habitat degradation and highly intolerant of metals contamination. Sample replicates taken at this site were highly variable in the total abundance of organisms present (67 organisms vs. approximately 361 organisms) and consequently in the calculated values of metrics. Total bioassessment scores (ecoregion reference) for the replicates differed by 29 percentage points, for a coefficient of variation (*V*) of 17.

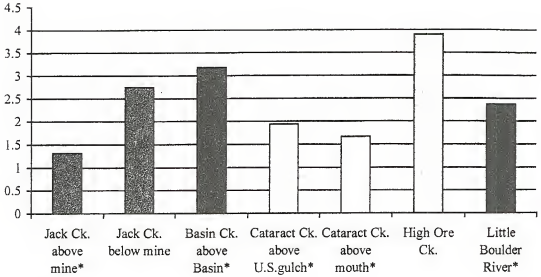

Figure 3. Calculated values for the metals tolerance index for tributaries of the Boulder River. Sites marked by an asterisk are represented by mean scores from replicated samples. Higher values of the metals tolerance index indicate communities with an overall higher tolerance to metals pollution.

Below the Bullion mine, a depauperate fauna strongly suggests severe impairment of water or habitat quality. The sample contained only 8 organisms. Figure 3 compares values for McGuire's metals tolerance index (Bukantis 1998) for all sites. The macroinvertebrate community collected from Jack Creek below the mine appears to be much more tolerant of metals contamination than the assemblage collected above the mine. The performance of the ecoregion reference and internal reference bioassessment methods seem to underestimate the severity of impairment at this site.

Replicate samples taken from Basin Creek above Basin produced similar total bioassessment scores using the ecoregion reference ($V = 2.7$). The mean metals tolerance index value of 3.18 is the second highest calculated among the sites studied, suggesting that metals may influence biotic health in Basin Creek. However, the relatively high total bioassessment score compared to the Montane Ecoregions reference suggests that biotic health is relatively unimpaired. Communities at this site were dominated by the stonefly *Zapada cinctipes*, and seven highly sensitive insect taxa were collected here. These included the mayflies *Drunella doddsi* and *Epeorus grandis* which were abundantly present in samples. These animals are both highly intolerant of a variety of anthropogenic impacts to water and habitat quality, including metals contamination.

Above Uncle Sam Gulch, Cataract Creek communities yielded ten highly sensitive insect taxa, including the mayfly *Caudatella hystrix* and a predatory caddisfly in the Rhyacophila Vofixa Group (*Rhyacophila iranda*). Replicate samples were rather variable in calculated total bioassessment scores, however ($V = 14.6$), based upon the ecoregion criteria.

Metals tolerance index values were low for Cataract Creek sites both above and below Uncle Sam Gulch, suggesting sensitivity to metals pollution. Communities at both locations were dominated by the sensitive heptageniid mayfly *Eperous grandis*. At the

lower site, however, the samples produced evidence of defaunation; one replicate contained only 52 organisms, the other 98. As a result, total bioassessment scores, which classify this site as only slightly impaired, are suspect, since a depauperate fauna is strong evidence of severe impairment of water or habitat quality, unless scouring flow conditions have temporarily compromised the community. Both bioassessment methods seem to have overestimated biotic health at the Cataract Creek site below Uncle Sam Gulch.

The sample collected at High Ore Creek contained only ten organisms, suggesting severe impairment of water and/or habitat quality. The metals tolerance index calculated for the community, 3.9, was the highest for any site in this study, suggesting that metals contamination may be a factor in limiting biotic health at this site. Again, bioassessment scores from either method seem to have overestimated biotic health at this site.

Excellent total bioassessment scores with little variation between replicates (V = 5) were calculated for assemblages sampled from the Little Boulder River. High taxa richness and EPT richness characterized the communities, which were dominated by the scraper *Glossosoma* sp. The metals tolerance index was calculated at 2.37, suggesting that metals contamination may have only a minimal effect on biotic health.

CONCLUSIONS

- Depauperate fauna at Jack Creek below the Bullion mine, at Cataract Creek below Uncle Sam Gulch, and at High Ore Creek suggests severe impairment of biotic health. Since habitat information was not available, the source of the impairment cannot be distinguished. However, the presence of metal mines near these locations strongly suggests that metals contamination may be a factor. Total bioassessment scores for these sites greatly underestimate the severity of impairment, especially at the lower Cataract Creek site. The underestimation may be due to the small sample size or to insensitivity of metrics.
- Possible evidence of defaunation was also apparent at the upper Jack Creek site, above the Bullion mine, where one replicate contained relatively few organisms. The cause of the observed low abundance of benthos was not apparent from the community data.
- A range of variation in total bioassessment scores (using ecoregion criteria) for individual sample replicates was noted. The coefficient of variation (V) for replicate pairs ranged from 17 (Jack Creek above the Bullion mine) to 2.7 (Basin Creek). Mean value for V for five replicate pairs was 8.7.
- Basin Creek above Basin and the Little Boulder River had diverse, sensitive benthic communities comparable to those of unimpaired streams in the Montane Ecoregions.
- Above Uncle Sam Gulch, Cataract Creek samples were too variable to give definitive results, however, the presence of abundant sensitive taxa suggests that the assemblage is unimpaired.

ADDENDUM

Results of a revised bioassessment method (Bollman 1998) for tributaries of the Boulder River are summarized in Figure 4. Table A tabulates coefficients of variation for each replicate pair based on results obtained from each of the three bioassessment methods used in this report.

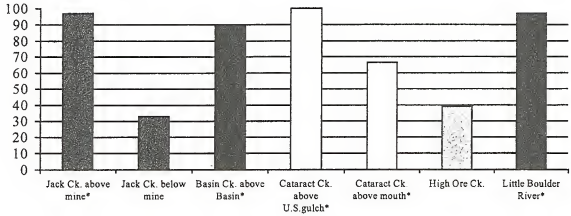

Figure 4. Total bioassessment scores for tributaries of the Boulder River, using a revised bioassessment method. Scores for sites marked by asterisks are mean scores for replicated samples.

Table A. Coefficients of variation (*V*) for sample replicates when three bioassessment criteria are applied.

	Montane Ecoregions reference criteria	Internal reference criteria	Revised bioassessment method criteria
Jack Creek above Bullion mine	17	10.5	3.1
Basin Creek above Basin	2.7	7	0
Cataract Creek above U.S. Gulch	14.6	7	0
Cataract Creek below U.S. Gulch	4.2	7	8
Little Boulder River	5	7.5	3.1
Mean *V*	8.7	7.8	2.8

LITERATURE CITED

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TABLES

TABLES

Table 1a. Metric values and bioassessments for Jack Creek, Boulder River drainage. September 5, 1997. Montane Ecoregions reference.

metric	Jack Creek above Bullion Mine R 4.1	Jack Creek above Bullion Mine R 4.2	Jack Creek below Bullion Mine R 5.1
Taxa richness	19	33	6
EPT richness	13	21	2
Biotic index	1.27	1.33	3.00
% dominant taxon	30	22	38
% Collector (g+ff)	15	17	12.5
% Scrapers + Shredders	76	74	37.5
% EPT	87	89	38
metric score			
Taxa richness	1	3	0
EPT richness	0	3	0
Biotic index	3	3	2
% dominant taxon	2	3	1
% Collector (g+ff)	3	3	3
% Scrapers + Shredders	3	3	1
% EPT	3	3	0
total score (max = 21)	15	21	7
% maximum	71	100	33
classification *	SLI	NON	MOD
use support	PARTIAL	FULL	PARTIAL

* classifications: (NON) non-impaired, (SLI) slightly impaired, (MOD) moderately impaired, (SEV) severely impaired. .

Table 1b. Metric values and bioassessments for Basin Creek, Boulder River drainage. September 5, 1997. Montane Ecoregions reference.

metric	Basin Creek above Basin R 3.1	Basin Creek above Basin R 3.2
Taxa richness	33	37
EPT richness	19	20
Biotic index	2.91	2.92
% dominant taxon	18	24
% Collector (g+ff)	40	37
% Scrapers + Shredders	51	54
% EPT	73	78
metric score		
Taxa richness	3	3
EPT richness	2	3
Biotic index	3	3
% dominant taxon	3	3
% Collector (g+ff)	3	3
% Scrapers + Shredders	2	2
% EPT	3	3
total score (max = 21)	19	20
% maximum	90	95
classification *	NON	NON
use support	FULL	FULL

* classifications: (NON) non-impaired, (SLI) slightly impaired, (MOD) moderately impaired, (SEV) severely impaire

Table 1c. Metric values and bioassessments for Cataract Creek, Boulder River drainage. September 5, 1997. Montane Ecoregions reference.

metric	Cataract Creek above Uncle Sam Gulch R 2.1	Cataract Creek above Uncle Sam Gulch R 2.2	Cataract Creek below Uncle Sam Gulch R 1.1	Cataract Creek below Uncle Sam Gulch R 1.2
Taxa richness	31	35	11	17
EPT richness	16	23	6	9
Biotic index	2.04	2.06	1.12	1.16
% dominant taxon	36	13	56	43
% Collector (g+ff)	31	43	6	11
% Scrapers + Shredders	59	36	85	69
% EPT	70	74	79	83
metric score				
Taxa richness	3	3	0	0
EPT richness	1	3	0	0
Biotic index	3	3	3	3
% dominant taxon	1	3	0	1
% Collector (g+ff)	3	3	3	3
% Scrapers + Shredders	3	1	3	3
% EPT	2	3	3	3
total score (max = 21)	14	19	12	13
% maximum	67	90	57	62
classification *	SLI	NON	SLI	SLI
use support	PARTIAL	FULL	PARTIAL	PARTIAL

* classifications: (NON) non-impaired, (SLI) slightly impaired, (MOD) moderately impaired, (SEV) severely impaired.

Table 1d. Metric values and bioassessments for High Ore Creek and the Little Boulder River, Boulder River drainage. September 12, 1997. Montane Ecoregions reference.

metric	High Ore Creek R 1	Little Boulder River R 1.1	Little Boulder River R 1.2
Taxa richness	6	38	39
EPT richness	2	21	23
Biotic index	3.00	2.09	1.72
% dominant taxon	40	43	22
% Collector (g+ff)	20	31	26
% Scrapers + Shredders	0	62	69
% EPT	50	75	81
metric score			
Taxa richness	0	3	3
EPT richness	0	3	3
Biotic index	2	3	3
% dominant taxon	1	1	3
% Collector (g+ff)	3	3	3
% Scrapers + Shredders	0	3	3
% EPT	1	3	3
total score (max = 21)	7	19	21
% maximum	33	90	100
classification *	MOD	NON	NON
use support	PARTIAL	FULL	FULL

* classifications: (NON) non-impaired, (SLI) slightly impaired, (MOD) moderately impaired, (SEV) severely impaired.

Table 2. **Internal reference values and criteria for assigning scores to metrics based on percent comparability to reference values (adapted from McGuire 1995):**

metric	Little Boulder River R 1.2	Scoring Criteria 3	2	1	0	*
Taxa richness	39	> 80%	80-60%	60-40%	< 40%	a
EPT richness	23	> 85%	85-70%	70-50%	< 50%	a
Biotic index	1.72	> 90%	90-80%	80-70%	< 70%	b
% dominant taxon	22	> 60%	60-45%	45-30%	< 30%	b
% Gath. + Filt.	26	> 90%	90-80%	80-70%	< 70%	b
% Scraper +Shredder	69	> 80%	80-60%	60-40%	< 40%	a
% EPT	81	> 75%	75-50%	50-25%	< 25%	a

* a = score is ratio of study site to reference x 100.

* b = score is ratio of reference to study site x 100.

Table 3a. Criteria for the assignment of support classifications / standards violation thresholds (from Bukantis, 1997)

% Comparability to reference	Use support
>75	Full support--standards not violated
25-75	Partial support--moderate impairment--standards violated
<25	Non-support--severe impairment--standards violated

Table 3b. Criteria for the assignment of impairment classifications (from Plafkin et al. 1989).

% Comparability to reference	Classification
> 83	nonimpaired
54-79	slightly impaired
21-50	moderately impaired
<17	severely impaired

Table 4a. Percentage of internal reference for metrics, and bioassessments for Jack Creek, Boulder River drainage. September 5, 1997.

metric	Jack Creek above Bullion Mine R 4.1	Jack Creek above Bullion Mine R 4.2	Jack Creek below Bullion Mine R 5.1
Taxa richness	49	85	15
EPT richness	57	91	9
Biotic index	100	100	57
% dominant taxon	73	100	58
% Collector (g+ff)	100	100	100
% Scrapers + Shredders	100	100	54
% EPT	100	100	47
metric score			
Taxa richness	1	3	0
EPT richness	1	3	0
Biotic index	3	3	0
% dominant taxon	3	3	2
% Collector (g+ff)	3	3	3
% Scrapers + Shredders	3	3	1
% EPT	3	3	1
total score (max = 21)	17	21	7
% reference	81	100	33
classification *	SLI	NON	MOD
use support	FULL	FULL	PARTIAL

* classifications: (NON) non-impaired, (SLI) slightly impaired, (MOD) moderately impaired, (SEV) severely impaired. .

Table 4b. Percentage of internal reference for metrics and bioassessments for Basin Creek, Boulder River drainage. September 5, 1997.

metric	Basin Creek above Basin R 3.1	Basin Creek above Basin R 3.2
Taxa richness	85	95
EPT richness	83	87
Biotic index	59	59
% dominant taxon	100	92
% Collector (g+ff)	65	70
% Scrapers + Shredders	74	78
% EPT	90	96
metric score		
Taxa richness	3	3
EPT richness	2	3
Biotic index	0	0
% dominant taxon	3	3
% Collector (g+ff)	0	1
% Scrapers + Shredders	2	2
% EPT	3	3
total score (max = 21)	13	15
% reference	62	71
classification *	SLI	SLI
use support	PARTIAL	PARTIAL

* classifications: (NON) non-impaired, (SLI) slightly impaired, (MOD) moderately impaired, (SEV) severely impaire

Table 4c. Metric values, percentage of reference and bioassessments for Cataract Creek, Boulder River drainage. September 5, 1997.

metric	Cataract Creek above Uncle Sam Gulch R 2.1	Cataract Creek above Uncle Sam Gulch R 2.2	Cataract Creek below Uncle Sam Gulch R 1.1	Cataract Creek below Uncle Sam Gulch R 1.2
Taxa richness	79	90	28	44
EPT richness	70	100	26	39
Biotic index	84	83	100	100
% dominant taxon	61	100	39	51
% Collector (g+ff)	84	60	100	100
% Scrapers + Shredders	86	52	100	100
% EPT	86	91	98	100
metric score				
Taxa richness	2	3	0	1
EPT richness	2	3	0	0
Biotic index	2	2	3	3
% dominant taxon	3	3	1	2
% Collector (g+ff)	2	0	3	3
% Scrapers + Shredders	3	1	3	3
% EPT	3	3	3	3
total score (max = 21)	17	15	13	15
% reference	81	71	62	71
classification *	SLI	SLI	SLI	SLI
use support	FULL	PARTIAL	PARTIAL	PARTIAL

* classifications: (NON) non-impaired, (SLI) slightly impaired, (MOD) moderately impaired, (SEV) severely impaired.

Table 4d. Metric values, percentage of reference and bioassessments for High Ore Creek and the Little Boulder River, Boulder River drainage. September 12, 1997.

metric	High Ore Creek R 1	Little Boulder River R 1.1	Little Boulder River R 1.2
Taxa richness	15	97	100
EPT richness	9	91	100
Biotic index	51	82	100
% dominant taxon	55	51	100
% Collector (g+ff)	100	84	100
% Scrapers + Shredders	0	90	100
% EPT	62	93	100
metric score			
Taxa richness	0	3	3
EPT richness	0	3	3
Biotic index	0	2	3
% dominant taxon	2	2	3
% Collector (g+ff)	3	2	3
% Scrapers + Shredders	0	3	3
% EPT	2	3	3
total score (max = 21)	7	18	21
% reference	33	86	100
classification *	MOD	NON	NON
use support	PARTIAL	FULL	FULL

* classifications: (NON) non-impaired, (SLI) slightly impaired, (MOD) moderately impaired, (SEV) severely impaired. .

Table 4d. Metric values, percentage of reference and bioassessments for High Ore Creek and the Little Boulder River, Boulder River drainage. September 12, 1997.

metric	High Ore Creek R 1	Little Boulder River R 1.1	Little Boulder River R 1.2
Taxa richness	15	97	100
EPT richness	9	91	100
Biotic index	51	82	100
% dominant taxon	55	51	100
% Collector (g+ff)	100	84	100
% Scrapers + Shredders	0	90	100
% EPT	62	93	100
metric score			
Taxa richness	0	3	3
EPT richness	0	3	3
Biotic index	0	2	3
% dominant taxon	2	2	3
% Collector (g+ff)	3	2	3
% Scrapers + Shredders	0	3	3
% EPT	2	3	3
total score (max = 21)	7	18	21
% reference	33	86	100
classification *	MOD	NON	NON
use support	PARTIAL	FULL	FULL

* classifications: (NON) non-impaired, (SLI) slightly impaired, (MOD) moderately impaired, (SEV) severely impaired.

APPENDIX

Macroinvertebrate Taxonomic Data

Jack Ck. above Boullion Mine 970905 R4.1

Taxon	#	%	BI	FFG
Oligochaeta: Enchytraeidae	2	2.99	10	CG
TOTAL: MISC. TAXA	2	2.99		
Baetis tricaudatus	1	1.49	4	CG
Epeorus albertae	2	2.99	2	SC
Epeorus grandis	8	11.94	0	SC
Rhithrogena robusta	20	29.85	0	SC
Ameletus	1	1.49	0	CG
TOTAL: EPHEMEROPTERA	32	47.76		
Visoka cataractae	3	4.48	0	SH
Zapada columbiana	12	17.91	2	SH
Doroneuria	1	1.49	0	PR
Megarcys	2	2.99	1	PR
Yoraperla	2	2.99	0	SH
TOTAL: PLECOPTERA	20	29.85		
Arctopsyche grandis	2	2.99	2	CF
Glossosoma	3	4.48	0	SC
Rhyacophila Sibirica Gr.	1	1.49	0	PR
TOTAL: TRICHOPTERA	6	8.96		
Heterlimnius	3	4.48	3	CG
TOTAL: COLEOPTERA	3	4.48		
Chelifera	1	1.49	5	PR
Hexatoma	1	1.49	2	PR
TOTAL: DIPTERA	2	2.99		
Cricotopus Nostococladius	1	1.49	6	SH
Parametriocnemus	1	1.49	5	CG
TOTAL: CHIRONOMIDAE	2	2.99		
GRAND TOTAL	67	100.00		

Macroinvertebrate Taxonomic Data

Jack Creek above Boullion Mine 970905 R4.2

Taxon	#	%	BI	FFG
Oligochaeta: Enchytraeidae	13	4.23	10	CG
Acari	1	0.33	5	PA
TOTAL: MISC. TAXA	14	4.56		
Baetis tricaudatus	8	2.61	4	CG
Drunella doddsi	1	0.33	1	SC
Cinygmula	6	1.95	0	SC
Epeorus albertae	9	2.93	2	SC
Epeorus grandis	68	22.15	0	SC
Rhithrogena robusta	46	14.98	0	SC
Ameletus	2	0.65	0	CG
TOTAL: EPHEMEROPTERA	140	45.60		
Visoka cataractae	10	3.26	0	SH
Zapada columbiana	69	22.48	2	SH
Doroneuria	3	0.98	0	PR
Megarcys	5	1.63	1	PR
Setvena bradleyi	4	1.30	0	PR
Yoraperla	9	2.93	0	SH
TOTAL: PLECOPTERA	100	32.57		
Parapsyche elsis	13	4.23	0	CF
Glossosoma	3	0.98	0	SC
Wormaldia	2	0.65	0	CF
Rhyacophila Betteni Gr.	2	0.65	0	PR
Rhyacophila Brunnea Gr.	2	0.65	2	PR
Rhyacophila Hyalinata Gr.	6	1.95	0	PR
Rhyacophila Vofixa Gr.	4	1.30	0	PR
Neothremma alicia	1	0.33	1	SC
TOTAL: TRICHOPTERA	33	10.75		
Heterlimnius	7	2.28	3	CG
TOTAL: COLEOPTERA	7	2.28		
Prosimulium	2	0.65	4	CF
Dicranota	1	0.33	3	PR
Hexatoma	1	0.33	2	PR
TOTAL: DIPTERA	4	1.30		
Brillia	3	0.98	4	SH
Cricotopus Nostococladius	2	0.65	6	SH
Eukiefferiella Brehmi Gp.	1	0.33	8	CG
Micropsectra	1	0.33	4	CG
Pagastia	1	0.33	1	CG
Rheocricotopus	1	0.33	4	CG
TOTAL: CHIRONOMIDAE	9	2.93		
GRAND TOTAL	307	100.00		

Aquatic Macroinvertebrate Data: Jack Creek above Bullion mine: September 5, 1997

Sample:	4.1	4.2
% of sample used:	100	85
Subsample size	67	307
Taxa richness	19	33
EPT richness	13	21
Biotic index	1.27	1.33
% Dominant taxon	30	22.5
% EPT	87	89
% Collectors (g+f)	15	17
% Scrapers + Shredders	76	74
% Hydropsychinae of Trich	0	0
Metals tolerance index	1.51	1.12
Shannon Diversity (log2)	3.41	3.69
EPT/Chironomidae	29	30
CTQa	47.79	49.45
%Baetidae of Ephemeroptera	3	6
% Coleoptera	4.5	2
% Diptera	3	1
% Chironomidae	3	3
% Ephemeroptera	48	46
% Plecoptera	30	33
% Trichoptera	9	11
% multivoltine	3	4
% univoltine	85	84
% semivoltine	11	12

Functional Feeding Grp.	%RA	# taxa	%RA	# taxa
Filterers	3	1	6	3
Collector-Gatherers	12	5	11	8
Shredders	27	4	30	5
Scrapers	49	4	44	7
Predators	9	5	9	9

Est. total number of organisms	67	361
Est. number collected per foot	4.5	18
Est. number collected per minute	67	361

Macroinvertebrate Taxonomic Data

Jack Creek below Boullion Mine 970905 R5.1

Taxon	#	%	BI	FFG
Rhyacophila Hyalinata Gr.	1	12.50	1	PR
Rhyacophila Vofixa Gr.	2	25.00	1	PR
TOTAL: TRICHOPTERA	3	37.50		
Petrophila	1	12.50	5	SC
TOTAL: LEPIDOPTERA	1	12.50		
Heterlimnius	1	12.50	3	CG
TOTAL: COLEOPTERA	1	12.50		
Atherix	1	12.50	5	PR
TOTAL: DIPTERA	1	12.50		
Brillia	2	25.00	4	SH
TOTAL: CHIRONOMIDAE	2	25.00		
GRAND TOTAL	8	100.00		

Aquatic Macroinvertebrate Data: Jack Creek below Bullion mine: September 5, 1997

Sample:	5.1
% of sample used:	100
Subsample size	8
Taxa richness	6
EPT richness	2
Biotic index	3.00
% Dominant taxon	25
% EPT	38
% Collectors (g+f)	12.5
% Scrapers + Shredders	37.5
% Hydropsychinae of Trich	0
Metals tolerance index	2.75
Shannon Diversity (log2)	2.16
EPT/Chironomidae	1.5
CTQa	undefined
%Baetidae of Ephemeroptera	0
% Coleoptera	12.5
% Diptera	12.5
% Chironomidae	25
% Ephemeroptera	0
% Plecoptera	0
% Trichoptera	37.5
% multivoltine	19
% univoltine	50
% semivoltine	31

Functional Feeding Grp.	%RA	# taxa
Filterers	0	0
Collector-Gatherers	12.5	1
Shredders	25	1
Scrapers	12.5	1
Predators	50	3

Est. total number of organisms	8
Est. number collected per foot	<1
Est. number collected per minute	8

Macroinvertebrate Taxonomic Data

Basin Creek above Basin 970905 R3.1

Taxon	#	%	BI	FFG
Nematoda	2	0.63	5	OM
Oligochaeta: Enchytraeidae	4	1.27	10	CG
Acari	3	0.95	5	PA
TOTAL: MISC. TAXA	9	2.85		
Baetis tricaudatus	24	7.59	4	CG
Drunella doddsi	15	4.75	1	SC
Cinygmula	1	0.32	0	SC
Epeorus longimanus	1	0.32	1	SC
Epeorus grandis	17	5.38	0	SC
Rhithrogena robusta	10	3.16	0	SC
TOTAL: EPHEMEROPTERA	68	21.52		
Paraperla	1	0.32	0	PR
Zapada cinctipes	56	17.72	3	SH
Doroneuria	8	2.53	0	PR
Hesperoperla pacifica	2	0.63	1	PR
Megarcys	6	1.90	1	PR
TOTAL: PLECOPTERA	73	23.10		
Arctopsyche grandis	31	9.81	2	CF
Brachycentrus americanus	4	1.27	1	SC
Micrasema	2	0.63	1	SH
Glossosoma	34	10.76	0	SC
Hydropsyche	16	5.06	5	CF
Lepidostoma	1	0.32	1	SH
Rhyacophila Brunnea Gr.	1	0.32	2	PR
Rhyacophila Hyalinata Gr.	1	0.32	0	PR
TOTAL: TRICHOPTERA	90	28.48		
Heterlimnius	2	0.63	3	CG
Narpus	5	1.58	2	SH
Optioservus	14	4.43	5	SC
Zaitzevia	9	2.85	4	CG
TOTAL: COLEOPTERA	30	9.49		
Ceratopogonidae	4	1.27	6	PR
Simulium	5	1.58	5	CF
Rhabdomastix	2	0.63	1	PR
TOTAL: DIPTERA	11	3.48		
Cricotopus	31	9.81	7	CG
Eukiefferiella Devonica Gr.	2	0.63	8	CG
Micropsectra	1	0.32	4	CG
Rheocricotopus	1	0.32	4	CG
TOTAL: CHIRONOMIDAE	35	11.08		
GRAND TOTAL	316	100.00		

Macroinvertebrate Taxonomic Data

Basin Creek above Basin 970905 R3.1

Taxon	#	%	BI	FFG
Nematoda	2	0.63	5	OM
Oligochaeta: Enchytraeidae	4	1.27	10	CG
Acari	3	0.95	5	PA
TOTAL: MISC. TAXA	9	2.85		
Baetis tricaudatus	24	7.59	4	CG
Drunella doddsi	15	4.75	1	SC
Cinygmula	1	0.32	0	SC
Epeorus longimanus	1	0.32	1	SC
Epeorus grandis	17	5.38	0	SC
Rhithrogena robusta	10	3.16	0	SC
TOTAL: EPHEMEROPTERA	68	21.52		
Paraperla	1	0.32	0	PR
Zapada cinctipes	56	17.72	3	SH
Doroneuria	8	2.53	0	PR
Hesperoperla pacifica	2	0.63	1	PR
Megarcys	6	1.90	1	PR
TOTAL: PLECOPTERA	73	23.10		
Arctopsyche grandis	31	9.81	2	CF
Brachycentrus americanus	4	1.27	1	SC
Micrasema	2	0.63	1	SH
Glossosoma	34	10.76	0	SC
Hydropsyche	16	5.06	5	CF
Lepidostoma	1	0.32	1	SH
Rhyacophila Brunnea Gr.	1	0.32	2	PR
Rhyacophila Hyalinata Gr.	1	0.32	0	PR
TOTAL: TRICHOPTERA	90	28.48		
Heterlimnius	2	0.63	3	CG
Narpus	5	1.58	2	SH
Optioservus	14	4.43	5	SC
Zaitzevia	9	2.85	4	CG
TOTAL: COLEOPTERA	30	9.49		
Ceratopogonidae	4	1.27	6	PR
Simulium	5	1.58	5	CF
Rhabdomastix	2	0.63	1	PR
TOTAL: DIPTERA	11	3.48		
Cricotopus	31	9.81	7	CG
Eukiefferiella Devonica Gr.	2	0.63	8	CG
Micropsectra	1	0.32	4	CG
Rheocricotopus	1	0.32	4	CG
TOTAL: CHIRONOMIDAE	35	11.08		
GRAND TOTAL	316	100.00		

Basin Creek above Basin 970905 R3.2

Taxon	#	%	BI	FFG
Turbellaria	1	0.30	4	PR
Nematoda	2	0.60	5	OM
Oligochaeta: Enchytraeidae	11	3.29	10	CG
Acari	1	0.30	5	PA
TOTAL: MISC. TAXA	15	4.49		
Baetis tricaudatus	35	10.48	4	CG
Drunella doddsi	21	6.29	1	SC
Cinygmula	3	0.90	0	SC
Epeorus grandis	17	5.09	0	SC
Rhithrogena robusta	7	2.10	0	SC
TOTAL: EPHEMEROPTERA	83	24.85		
Leuctridae	1	0.30	0	SH
Amphinemura	2	0.60	2	SH
Zapada cinctipes	80	23.95	3	SH
Doroneuria	5	1.50	0	PR
Hesperoperla pacifica	1	0.30	1	PR
Megarcys	12	3.59	1	PR
Skwala	1	0.30	3	PR
Pteronarcella	1	0.30	4	SH
TOTAL: PLECOPTERA	103	30.84		
Arctopsyche grandis	22	6.59	2	CF
Brachycentrus americanus	6	1.80	1	SC
Micrasema	2	0.60	1	SH
Glossosoma	19	5.69	0	SC
Hydropsyche	17	5.09	5	CF
Lepidostoma	4	1.20	1	SH
Rhyacophila Brunnea Gr.	2	0.60	2	PR
TOTAL: TRICHOPTERA	72	21.56		
Heterlimnius	3	0.90	3	CG
Narpus	7	2.10	2	SH
Optioservus	10	2.99	5	SC
TOTAL: COLEOPTERA	20	5.99		
Atherix	1	0.30	5	PR
Simulium	5	1.50	5	CF
Antocha	1	0.30	3	CG
Rhabdomastix	2	0.60	1	PR
TOTAL: DIPTERA	9	2.69		
Brillia	1	0.30	4	SH
Diamesa	4	1.20	5	CG
Eukiefferiella Devonica Gr.	1	0.30	8	CG
Micropsectra	1	0.30	4	CG
Orthocladius	19	6.89	6	CG
Rheocricotopus	2	0.60	4	CG
TOTAL: CHIRONOMIDAE	32	9.58		
GRAND TOTAL	330	100.00		

Aquatic Macroinvertebrate Data: Basin Creek above Basin, September 5, 1997

Sample:	3.1	3.2
% of sample used:	100	100
Subsample size	316	330
Taxa richness	33	37
EPT richness	19	20
Biotic index	2.91	2.93
% Dominant taxon	18	24
% EPT	73	78
% Collectors (g+f)	40	37
% Scrapers + Shredders	51	54
% Hydropsychinae of Trich	18	24
Metals tolerance index	3.43	2.93
Shannon Diversity (log2)	4.11	4.11
EPT/Chironomidae	6.6	9.2
CTQa	59.76	57.70
%Baetidae of Ephemeroptera	35	42
% Coleoptera	9	6
% Diptera	3	3
% Chironomidae	11	10
% Ephemeroptera	22	25
% Plecoptera	23	31
% Trichoptera	28	22
% multivoltine	17	17
% univoltine	58	65
% semivoltine	25	19

Functional Feeding Grp.	%RA	# taxa	%RA	# taxa
Filterers	16	3	13	3
Collector-Gatherers	23	8	24	9
Shredders	20	4	29	8
Scrapers	30	8	25	7
Predators	8	8	7	8

Est. total number of organisms	316	330
Est. number collected per foot	18	16.5
Est. number collected per minute	316	330

Macroinvertebrate Taxonomic Data

Cataract Ck above US Gulch 970905 R2.1

Taxon	#	%	BI	FFG
Nematoda	1	0.30	5	OM
Oligochaeta: Enchytraeidae	23	6.99	10	CG
TOTAL: MISC. TAXA	24	7.29		
Baetis bicaudatus	4	1.22	2	CG
Baetis tricaudatus	3	0.91	4	CG
Caudatella heterocaudata	2	0.61	0	SC
Drunella doddsi	8	2.43	1	SC
Epeorus longimanus	3	0.91	1	SC
Epeorus grandis	119	36.17	0	SC
Rhithrogena robusta	6	1.82	0	SC
TOTAL: EPHEMEROPTERA	145	44.07		
Zapada cinctipes	6	1.82	3	SH
Zapada columbiana	7	2.13	2	SH
Doroneuria	6	1.82	0	PR
Megarcys	13	3.95	1	PR
TOTAL: PLECOPTERA	32	9.73		
Micrasema	15	4.56	1	SH
Glossosoma	27	8.21	0	SC
Rhyacophila Betteni Gr.	3	0.91	0	PR
Rhyacophila Brunnea Gr.	6	1.82	2	PR
Rhyacophila Vofixa Gr.	2	0.61	0	PR
TOTAL: TRICHOPTERA	53	16.11		
Cleptelmis	7	2.13	4	CG
Heterlimnius	18	5.47	3	CG
TOTAL: COLEOPTERA	25	7.60		
Simulium	1	0.30	5	CF
Antocha	1	0.30	3	CG
Dicranota	1	0.30	3	PR
Hexatoma	1	0.30	2	PR
TOTAL: DIPTERA	4	1.22		
Brillia	2	0.61	4	SH
Eukiefferiella Brehmi Gr.	14	4.26	4	CG
Eukiefferiella Devonica Gr.	3	0.91	8	CG
Eukiefferiella Gracei Gr.	1	0.30	4	CG
Micropsectra	2	0.61	4	CG
Orthocladius	22	6.69	6	CG
Pagastia	1	0.30	1	CG
Tvetenia Bavarica Gr.	1	0.30	5	CG
TOTAL: CHIRONOMIDAE	46	13.98		
GRAND TOTAL	329	100.00		

Macroinvertebrate Taxonomic Data

Cataract Ck. above Uncle Sam gulch 970905 R2.2

Taxon	#	%	BI	FFG
Turbellaria	1	0.36	4	PR
Nematoda	1	0.36	5	OM
Oligochaeta: Enchytraeidae	11	3.94	10	CG
Acari	1	0.36	5	PA
TOTAL: MISC. TAXA	14	5.02		
Acentrella insignificans	1	0.36	4	CG
Baetis bicaudatus	9	3.23	2	CG
Baetis tricaudatus	7	2.51	4	CG
Caudatella hystrix	5	1.79	0	CG
Drunella doddsi	6	2.15	1	SC
Epeorus longimanus	3	1.08	1	SC
Epeorus grandis	37	13.26	0	SC
Rhithrogena	8	2.87	0	SC
Ameletus	26	9.32	0	CG
TOTAL: EPHEMEROPTERA	102	36.56		
Chloroperlidae	1	0.36	1	PR
Zapada cinctipes	15	5.38	3	SH
Zapada columbiana	6	2.15	2	SH
Doroneuria	9	3.23	0	PR
Megarcys	27	9.68	1	PR
Yoraperla	1	0.36	0	SH
TOTAL: PLECOPTERA	59	21.15		
Arctopsyche grandis	4	1.43	2	CF
Micrasema	6	2.15	1	SH
Glossosoma	14	5.02	0	SC
Apatania	1	0.36	3	SC
Rhyacophila Betteni Gr.	3	1.08	0	PR
Rhyacophila Brunnea Gr.	15	5.38	2	PR
Rhyacophila narvae	1	0.36	0	PR
Rhyacophila Vofixa Gr.	1	0.36	0	PR
TOTAL: TRICHOPTERA	45	16.13		
Cleptelmis	9	3.23	4	CG
Heterlimnius	21	7.53	3	CG
TOTAL: COLEOPTERA	30	10.75		
Limnophila	1	0.36	3	MH
TOTAL: DIPTERA	1	0.36		
Brillia	2	0.72	4	SH
Cricotopus	1	0.36	7	CG
Eukiefferiella Devonica Gr.	1	0.36	8	CG
Eukiefferiella Brehmi Gr.	4	1.43	4	CG
Orthocladius	20	7.17	6	CG
TOTAL: CHIRONOMIDAE	28	10.04		
GRAND TOTAL	279	100.00		

Aquatic Macroinvertebrate Data: Cataract Creek above Uncle Sam Gulch, September 5, 1997.

Sample:	2.1	2.2
% of sample used:	85	100
Subsample size	329	279
Taxa richness	32	35
EPT richness	16	23
Biotic index	2.04	2.06
% Dominant taxon	36	13
% EPT	70	74
% Collectors (g+f)	31	43
% Scrapers + Shredders	59	36
% Hydropsychinae of Trich	0	0
Metals tolerance index	1.82	2.05
Shannon Diversity (log2)	3.66	4.38
EPT/Chironomidae	5	7
CTQa	59.84	54.20
%Baetidae of Ephemeroptera	5	17
% Coleoptera	8	11
% Diptera	1	<1
% Chironomidae	14	10
% Ephemeroptera	44	37
% Plecoptera	10	21
% Trichoptera	16	16
% multivoltine	12	13
% univoltine	73	66
% semivoltine	15	21

Functional Feeding Grp.	%RA	# taxa	%RA	# taxa
Filterers	.3	1	1	1
Collector-Gatherers	30	13	41	12
Shredders	9	4	11	5
Scrapers	50	6	25	6
Predators	10	7	21	8

Est. total number of organisms	387	279
Est. number collected per foot	22	36
Est. number collected per minute	363	279

Macroinvertebrate Taxonomic Data

Cataract Creek above mouth 970905 R1.1

Taxon	#	%	BI	FFG
Epeorus longimanus	1	1.92	1	SC
Epeorus grandis	29	55.77	0	SC
TOTAL: EPHEMEROPTERA	30	57.69		
Chloroperlidae	1	1.92	1	PR
Amphinemura	1	1.92	2	SH
Megarcys	3	5.77	1	PR
TOTAL: PLECOPTERA	5	9.62		
Brachycentrus americanus	6	11.54	1	SC
TOTAL: TRICHOPTERA	6	11.54		
Rhabdomastix	1	1.92	1	PR
TOTAL: DIPTERA	1	1.92		
Brillia	7	13.46	4	SH
Cricotopus Trifascia Gr.	1	1.92	6	CG
Orthocladius	1	1.92	6	CG
Rheocricotopus	1	1.92	4	CG
TOTAL: CHIRONOMIDAE	10	19.23		
GRAND TOTAL	52	100.00		

Macroinvertebrate Taxonomic Data

Cataract Ck nr mouth 970905 R1.2

Taxon	#	%	BI	FFG
Nematoda	1	1.02	5	OM
TOTAL: MISC. TAXA	1	1.02		
Drunella doddsi	4	4.08	1	SC
Epeorus grandis	42	42.86	0	SC
TOTAL: EPHEMEROPTERA	46	46.94		
Chloroperlidae (immature)	8	8.16	1	PR
Sweltsa	1	1.02	0	PR
Hesperoperla pacifica	1	1.02	1	PR
Megarcys	6	6.12	1	PR
TOTAL: PLECOPTERA	16	16.33		
Arctopsyche grandis	1	1.02	2	CF
Brachycentrus americanus	16	16.33	1	SC
Hydropsyche	1	1.02	5	CF
Limnephilidae (immature)	1	1.02	3	SH
TOTAL: TRICHOPTERA	19	19.39		
Heterlimnius	3	3.06	3	CG
Zaitzevia	1	1.02	4	CG
TOTAL: COLEOPTERA	4	4.08		
Ceratopogonidae	2	2.04	6	PR
TOTAL: DIPTERA	2	2.04		
Brillia	5	5.10	4	SH
Orthocladius	2	2.04	6	CG
Pagastia	2	2.04	1	CG
Tvetenia Bavarica Gr.	1	1.02	5	CG
TOTAL: CHIRONOMIDAE	10	10.20		
GRAND TOTAL	98	100.00		

Aquatic Macroinvertebrate Data: Cataract Creek below Uncle Sam Gulch, September 5, 1997.

Sample:	1.1	1.2
% of sample used:	100	100
Subsample size	52	98
Taxa richness	11	18
EPT richness	6	10
Biotic index	1.12	1.16
% Dominant taxon	56	43
% EPT	79	83
% Collectors (g+f)	6	11
% Scrapers + Shredders	85	69
% Hydropsychinae of Trich	0	5
Metals tolerance index	1.50	1.84
Shannon Diversity (log2)	2.22	2.94
EPT/Chironomidae	4.1	8
CTQa	56.73	68.28
%Baetidae of Ephemeroptera	0	0
% Coleoptera	0	4
% Diptera	2	2
% Chironomidae	19	10
% Ephemeroptera	58	47
% Plecoptera	10	16
% Trichoptera	12	19
% multivoltine	14	9
% univoltine	74	69
% semivoltine	12	22

Functional Feeding Grp.	%RA	# taxa	%RA	# taxa
Filterers	0	0	2	2
Collector-Gatherers	6	3	9	5
Shredders	15	2	6	2
Scrapers	69	3	63	3
Predators	10	3	18	5

Est. total number of organisms	52	98
Est. number collected per foot	3	5
Est. number collected per minute	52	93

Macroinvertebrate Taxonomic Data

High Ore Ck. 970904 R1

Taxon	#	%	BI	FFG
Nematoda	1	10.00	5	OM
TOTAL: MISC. TAXA	1	10.00		
Ochrotrichia	1	10.00	4	PH
Rhyacophila Angelita Gr.	4	40.00	0	PR
TOTAL: TRICHOPTERA	5	50.00		
Ceratopogonidae	1	10.00	6	PR
Chelifera	1	10.00	5	PR
TOTAL: DIPTERA	2	20.00		
Diamesa	2	20.00	5	CG
TOTAL: CHIRONOMIDAE	2	20.00		
GRAND TOTAL	10	100.00		

Aquatic Macroinvertebrate Data: High Ore Creek, September 4, 1997.

Sample:	1
% of sample used:	100
Subsample size	10
Taxa richness	6
EPT richness	2
Biotic index	3.00
% Dominant taxon	40
% EPT	50
% Collectors (g+f)	20
% Scrapers + Shredders	0
% Hydropsychinae of Trich	0
Metals tolerance index	3.9
Shannon Diversity (log2)	2.32
EPT/Chironomidae	2.5
CTQa	undefined
%Baetidae of Ephemeroptera	0
% Coleoptera	0
% Diptera	20
% Chironomidae	20
% Ephemeroptera	0
% Plecoptera	0
% Trichoptera	50
% multivoltine	32.5
% univoltine	47.5
% semivoltine	20

Functional Feeding Grp.	%RA	# taxa
Filterers	0	0
Collector-Gatherers	20	1
Shredders	0	0
Scrapers	0	0
Predators	60	3

Est. total number of organisms	10
Est. number collected per foot	<1
Est. number collected per minute	10

Macroinvertebrate Taxonomic Data

Little Boulder River 970912 R1.1

Taxon	#	%	BI	FFG
Oligochaeta:Enchytraeidae	21	6.38	10	CG
TOTAL: MISC. TAXA	21	6.38		
Baetis tricaudatus	7	2.13	4	CG
Drunella doddsi	10	3.04	1	SC
Ephemerella inermis	4	1.22	4	SC
Epeorus longimanus	1	0.30	1	SC
Rhithrogena	49	14.89	0	SC
Paraleptophlebia heteronea	2	0.61	1	CG
Ameletus	1	0.30	0	CG
TOTAL: EPHEMEROPTERA	74	22.49		
Zapada cinctipes	41	12.46	3	SH
Zapada Oregonensis Gr.	1	0.30	2	SH
Doroneuria	3	0.91	0	PR
Megarcys	5	1.52	1	PR
Skwala	1	0.30	3	PR
TOTAL: PLECOPTERA	51	15.50		
Arctopsyche grandis	14	4.26	2	CF
Brachycentrus americanus	10	3.04	1	SC
Glossosoma	77	23.40	0	SC
Lepidostoma	2	0.61	1	SH
Apatania	3	0.91	3	SC
Dolophilodes	7	2.13	0	CF
Rhyacophila Betteni Gr.	1	0.30	0	PR
Rhyacophila Brunnea Gr.	8	2.43	2	PR
Rhyacophila Hyalinata Gr.	1	0.30	0	PR
TOTAL: TRICHOPTERA	123	37.39		
Heterlimnius	34	10.33	3	CG
Narpus	1	0.30	2	SH
Zaitzevia	3	0.91	4	CG
TOTAL: COLEOPTERA	38	11.55		
Ceratopogonidae	2	0.61	6	PR
Glutops	1	0.30	1	PR
Pericoma	1	0.30	4	CG
Hexatoma	2	0.61	2	PR
TOTAL: DIPTERA	6	1.82		
Brillia	2	0.61	4	SH
Cricotopus Nostococladius	3	0.91	6	SH
Eukiefferiella Brehmi Gp.	2	0.61	8	CG
Orthocladius	2	0.61	6	CG
Pagastia	1	0.30	1	CG
Rheocricotopus	1	0.30	4	CG
Rheotanytarsus	1	0.30	6	CF
Thienemanniella	1	0.30	6	CG
Tvetenia Bavarica Gr.	3	0.91	5	CG
TOTAL: CHIRONOMIDAE	16	4.86		
GRAND TOTAL	329	100.00		

Macroinvertebrate Taxonomic Data
Little Boulder River 970912 R1.2

Taxon	#	%	BI	FFG
Oligochaeta: Enchytraeidae	10	3.12	10	CG
Acari	1	0.31	5	PA
TOTAL: MISC. TAXA	11	3.43		
Baetis tricaudatus	3	0.93	4	CG
Caudatella heterocaudata	12	3.74	0	SC
Drunella doddsi	12	3.74	1	SC
Drunella grandis	1	0.31	2	CG
Epeorus longimanus	2	0.62	1	SC
Epeorus grandis	1	0.31	0	SC
Rhithrogena	38	11.84	0	SC
Ameletus	1	0.31	0	CG
TOTAL: EPHEMEROPTERA	70	21.81		
Visoka cataractae	2	0.62	0	SH
Zapada cinctipes	38	11.84	3	SH
Zapada Oregonensis Gr.	2	0.62	2	SH
Hesperoperla pacifica	3	0.93	1	PR
Megarcys	3	0.93	1	PR
Skwala	1	0.31	3	PR
TOTAL: PLECOPTERA	49	15.26		
Arctopsyche grandis	19	5.92	2	CF
Brachycentrus americanus	19	5.92	1	SC
Micrasema	11	3.43	1	SH
Glossosoma	70	21.81	0	SC
Lepidostoma	3	0.93	1	SH
Apatania	2	0.62	3	SC
Dolophilodes	14	4.36	0	CF
Rhyacophila Brunnea Gr.	3	0.93	2	PR
Rhyacophila Hyalinata Gr.	1	0.31	0	PR
TOTAL: TRICHOPTERA	142	44.24		
Cleptelmis	11	3.43	4	CG
Heterlimnius	13	4.05	3	CG
Lara avara	1	0.31	1	SH
Zaitzevia	3	0.93	4	CG
TOTAL: COLEOPTERA	28	8.72		
Glutops	1	0.31	1	PR
Pericoma	1	0.31	4	CG
Simulium	1	0.31	5	CF
Antocha	1	0.31	3	CG
Hexatoma	2	0.62	2	PR
TOTAL: DIPTERA	6	1.87		
Brillia	2	0.62	4	SH
Corynoneura	1	0.31	7	CG
Cricotopus Nostococladius	6	1.87	6	SH
Eukiefferiella Brehmi Gp.	4	1.25	8	CG
Eukiefferiella Claripennis Gr.	1	0.31	8	CG
Symposiocladius	1	0.31	5	SH
TOTAL: CHIRONOMIDAE	15	4.67		
GRAND TOTAL	321	100.00		

Aquatic Macroinvertebrate Data: Little Boulder River, September 12, 1997.

Sample:	1.1	1.2
% of sample used:	40	50
Subsample size	329	321
Taxa richness	38	39
EPT richness	21	23
Biotic index	2.09	1.72
% Dominant taxon	23	22
% EPT	75	81
% Collectors (g+f)	31	26
% Scrapers + Shredders	62	69
% Hydropsychinae of Trich	0	0
Metals tolerance index	2.37	2.37
Shannon Diversity (log2)	3.85	4.12
EPT/Chironomidae	15.5	17.4
CTQa	56.27	52.74
%Baetidae of Ephemeroptera	9	4
% Coleoptera	12	9
% Diptera	2	2
% Chironomidae	5	5
% Ephemeroptera	22	22
% Plecoptera	15	15
% Trichoptera	37	44
% multivoltine	5	5
% univoltine	70	72
% semivoltine	24	24

Functional Feeding Grp.	%RA	# taxa	%RA	# taxa
Filterers	7	3	11	3
Collector-Gatherers	24	13	16	12
Shredders	15	6	21	9
Scrapers	47	7	49	8
Predators	7	9	4	7

Est. total number of organisms	823	642
Est. number collected per foot	34	32
Est. number collected per minute	329	642